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but gather in trees and just sit around. On such days all birds show a decreased weight, doubtless directly due to empty crops. When scattered over the open mesas feeding on doveweed, a rainy day interferes with their feeding. They simply sit around under the lee side of bushes, keeping dry. Nevertheless they make their regular evening flight to water although it would seem easy to gather the necessary water off the stems and leaves of plants. On such days the birds killed on the flyways to water show decreased weight due to empty crops.

The daily flight to water generally starts between 3:00 P. M. and 4:00 P. M. and reaches its height just before dark. Sometimes, where long distances must be traversed, the birds do not arrive at water until after dark. When the wind parallels the water flight, the flight going and coming will be at different levels; for instance with the wind blowing toward water, the birds going to water will fly high and with tremendous speed, while the birds beating their way back against the wind will fly so low as to be nearly hidden by ordinary sage-brush. Some hunters take advantage of this and shoot only the easy birds beating into the wind.

The dove's choice of watering places is peculiar. In the hills they like springs, stock tanks, and open sandy creeks. On the Rio Grande bottoms they use waste irrigation water spilled along open roads, grassy vegas provided the cover is short, and ponds with bare shores. It is generally supposed that they seek freedom from cover which might harbor natural enemies, but if this is the main factor governing their choice of watering places, then the shallow rills on the big open sandbars of the Rio Grande ought to suit them exactly. But I have never seen a dove light on a river sandbar. Here is an interesting problem to solve.

Many doves are killed yearly in New Mexico but no decrease in numbers is noticeable. The area adapted to doves is so enormous that the total population is probably very little affected by localized shooting.

Albuquerque, New Mexico, October 13, 1920.

CONCERNING THE STATUS OF THE SUPPOSED TWO RACES OF THE LONG-BILLED CURLEW

By JOSEPH GRINNELL

(Contribution from the Museum of Vertebrate Zoology of the University of California)

IN THE FALL of 1918 vertebrate collecting was carried on by a party from the California Museum of Vertebrate Zoology at Morro, San Luis Obispo County, California. Among the birds of interest obtained there was the series of Long-billed Curlew listed in the table presented farther along in this paper. The acquisition of so many specimens (fifteen) of this Curlew, taken from one locality and within a period of less than one month in a single year, seemed to afford ground for looking into the standing of the recently proposed two races of the species, namely *Numenius americanus americanus* Bechstein and *Numenius americanus occidentalis* Woodhouse. This separation was first pro-

posed by Bishop (Auk, xxvii, 1910, pp. 59-60) and was subsequently upheld by Oberholser (Auk, xxxv, 1918, pp. 188-195) and by Ridgway (Bds. N. and Mid. Amer., pt. viii, 1919, pp. 390-395). There is some question as to the name to be employed for one of the supposed races (*parvus* of Bishop versus *occidentalis* of Woodhouse), but this is a matter outside of the purpose of the discussion in the present contribution. I am here enquiring as to the nature of the variation I find in the series of Curlew from the one place in California. Is there represented geographic variation, in other words subspecific variation, as well as individual and sexual variation?

Referring further to the material under scrutiny: All the birds are in comparable plumage, as far as I can see. Wing and tail feathers are in no case so abraded as to leave margin for appreciable differences in measurements due to wear; in fact most of the plumage throughout is fresh. Molt of the body plumage is plainly in progress in all of the specimens, but the primary flight feathers, at least, have all been completely renewed at some not far remote time.

There is, of course, a strong probability that both old adults, more than one year old, and young of the year, are included, the latter in majority. But after some study, I have been unable to tell from any condition of the specimens, which are old and which young. They all look alike. Of course there *might* be some difference in length of bill due to age; on the other hand, since the bill is, in the curlew, of prime importance as a food-getting instrument, it may acquire its full proportions in the individual very promptly, as with the bill of a duck. It seems likely, therefore, that as regards measurements of bill, also, all the specimens (taken in September and October, four to five months old at youngest) are perfectly comparable. Age, then, is a factor which can safely be eliminated.

MEASUREMENTS (IN MILLIMETERS) AND WEIGHTS (IN GRAMS) OF FIFTEEN SPECIMENS OF *NUMENIUS AMERICANUS*, ALL FROM VICINITY OF MORRO, SAN LUIS OBISPO COUNTY, CALIFORNIA

Mus. No.	Sex	Date (1918)	Collector	Wing	Tail	Culmen	Tarsus	Weight
29645	♂	Sept. 21	J. Dixon	256	95.2	124.2	79.0	653.7
29649	♂	Sept. 22	J. Dixon	248	103.3	152.3	89.7	684.8
29650	♂	Sept. 22	J. Dixon	265	108.5	133.1	82.7	745.7
29651	♂	Sept. 28	J. Dixon	264	101.2	136.1	83.1	686.0
29653	♂	Oct. 1	J. Dixon	261	103.3	125.2	80.9	669.1
29654	♂	Oct. 1	J. Dixon	273	106.3	129.7	86.2	791.6
29658	♂	Oct. 6	H. G. White	260	107.6	129.8	81.0	620.0
			Average	261.0	103.6	132.9	83.2	692.9
29644	♀	Sept. 19	J. Dixon	286	106.0	201.7	89.1	838.0
29646	♀	Sept. 21	J. Dixon	275	107.1	159.6	87.8	833.0
29647	♀	Sept. 22	J. Dixon	280	106.4	161.4	87.7	902.0
29648	♀	Sept. 22	J. Dixon	290	108.6	177.6	91.2	873.0
29652	♀	Sept. 29	J. Dixon	291	203.0	93.5	951.1
29655	♀	Oct. 2	J. Dixon	290	106.2	164.8	87.9	630.0
29656	♀	Sept. 19	J. Grinnell	277	107.0	168.2	87.2	768.0
29657	♀	Sept. 25	H. G. White	272	99.6	170.2	85.5	730.0
			Average	280.5	105.4	175.9	88.7	815.6

Another important consideration is that none of the birds was taken on its breeding grounds. Morro Bay is 440 miles from the nearest point (Butte Valley, Siskiyou County, California) at which the Long-billed Curlew is known to have nested. But the species is now extinct there, and probably does not breed nearer to Morro than Malheur Lake, eastern Oregon, 530 miles away. Thence the species breeds to a maximum distance of about 1400 miles to the northeast, in southern Alberta, and to the same distance to the east, in Oklahoma and Texas. The California birds are all migratory, and come from some point in the breeding

range of the species within the limits above indicated. I have no present means of knowing what exact point or what general portion, even, of this breeding range the specimens taken come from, *unless* these birds can be shown definitely to possess subspecific characters as set forth for the two races claimed to be recognizable. This, then, becomes the special object of my enquiry.

In their diagnoses of the supposed two races of *Numenius americanus*, Bishop, Oberholser and Ridgway (places cited above) assign characters as follows:

	<i>americanus</i>	<i>occidentalis</i>
Bishop:	size larger	size "smaller"
(1910)	bill much longer	bill "much shorter"
Oberholser:	size "larger"	size "decidedly smaller"
(1918)	bill "particularly" longer	bill "particularly" shorter
	wing "particularly" longer	wing "particularly" shorter
Ridgway:	size larger	size "smaller"
(1919)	bill longer	bill "especially" shorter

No features of coloration have been ascribed; so that the differentiation of the two forms rests upon "size" (apparently as judged only from chord of closed wing) and, more particularly or especially, upon length of bill. It is obvious, therefore, that carefully ascertained measurements of an adequate number of comparable birds, are essential to determining the meaning of the variation shown in the species.

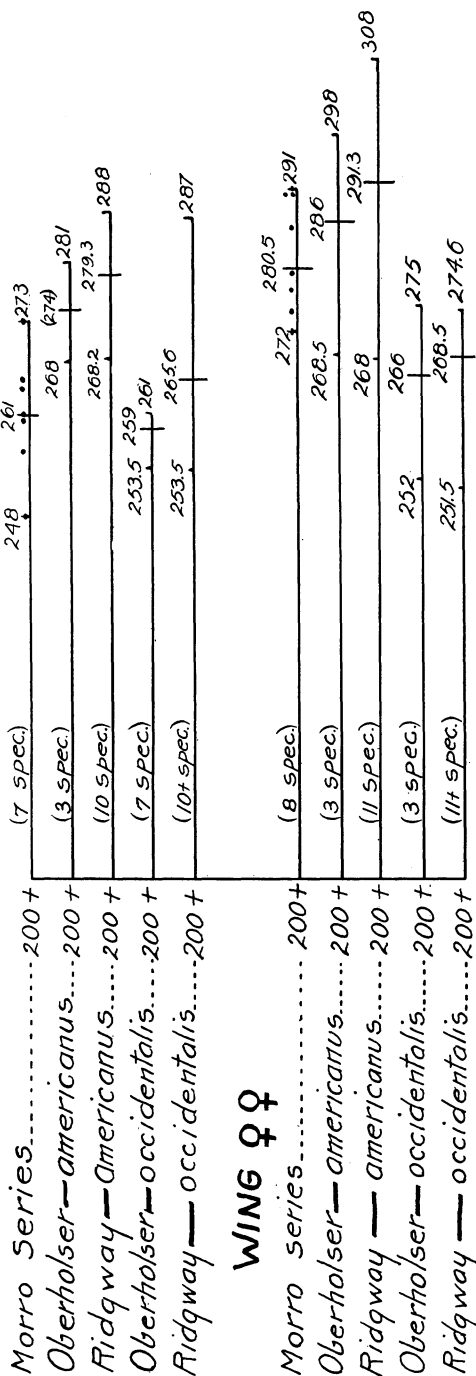
The measurements given by all the authors cited are those of wing, tail, exposed culmen, and tarsus. Bishop gave also length (total) and extent (spread of wings) of the type of "*parvus*" (*=occidentalis*); but these two dimensions are useless in the present study of the case.

Bishop measured a total of 13 males and 10 females representative of the two races he wished to differentiate as well as of intermediates between the two. Analysing Bishop's figures, which he gives in inches and hundredths, we find average and extremes given for 7 males and 3 females of unequivocal "*parvus*" (*occidentalis*) and for just 3 males and 3 females of unequivocal *americanus*.

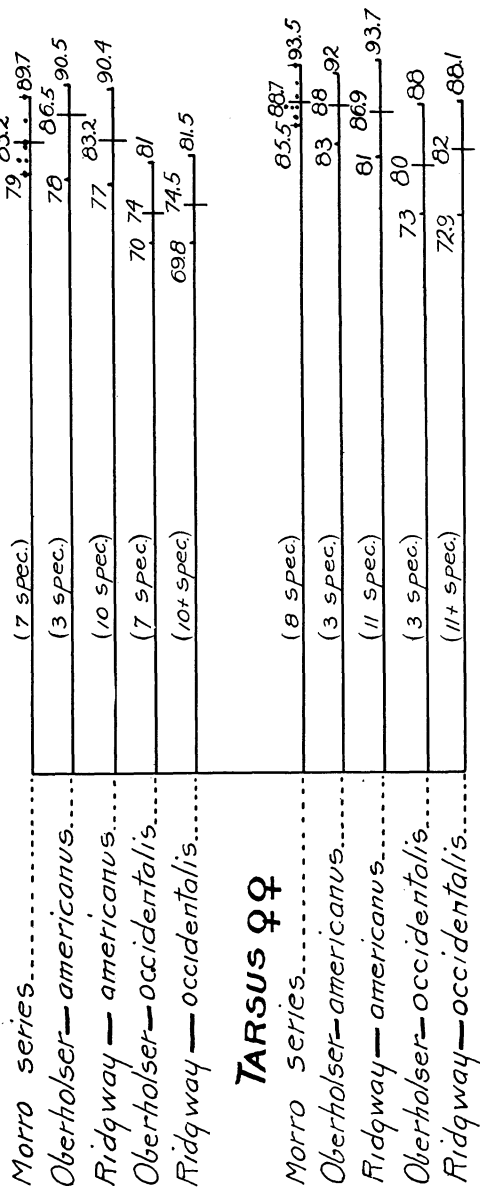
Turning to Oberholser's review of the problem, the first impression received is that the main object of this writer was to advance a nomenclatural point, namely, to raise the name *occidentalis* of Woodhouse to replace Bishop's *parvus*. There is no question, however, but that he thoroughly endorses the proposed division of the species. Oberholser says: "In this connection we have examined a total of 279 specimens". And yet, to the reader's inescapable astonishment, all of the measurements given by him are merely those of Bishop's sixteen birds "transposed into millimeters"! Not only does the validity of the two races depend upon definitely ascertained measurements, but also does the identification of the individual specimens so depend. Yet the localities for every one of the specimens are given with seeming exactitude under one name or the other. Moreover, the majority of these localities, to judge from the accompanying dates, are for migrants!

In the interests of accuracy in systematic ornithology I am compelled to point out this extraordinary lapse on the part of the author cited, in not giving original measurements of series of comparable specimens. This lapse vitiates all Oberholser's conclusions in regard to the ranges of the two alleged races, particularly as to the fall, winter and spring when the birds are more or less off their breeding grounds. The reader will recall here the well-known custom of a few systematists (Bishop, at least, included) of diagnosing individual speci-

WING ♂♂



TARSUS ♂♂



TARSUS ♀♀

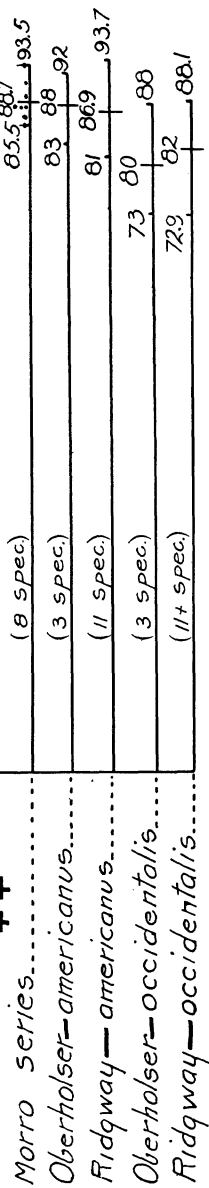
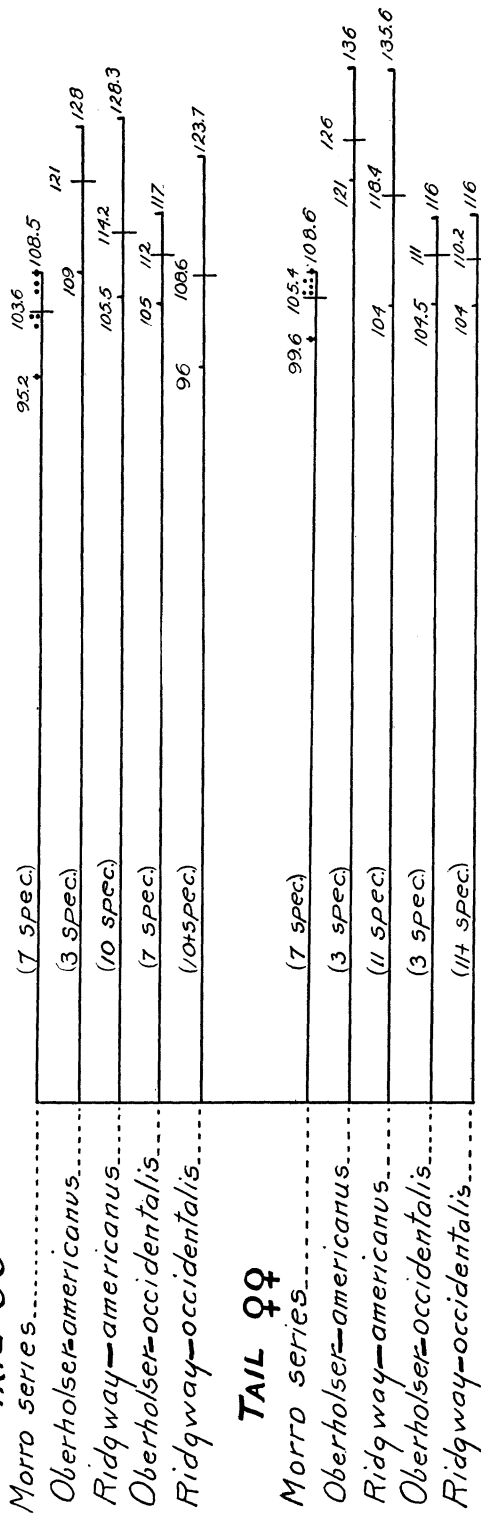
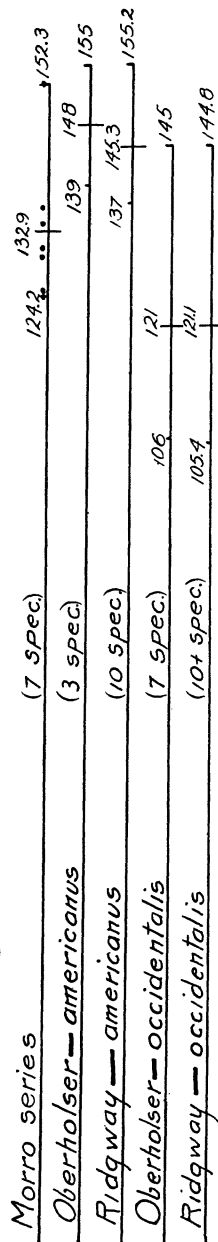


Fig. 5.

TAIL ♂♂



EXPOSED CULMEN ♂♂



EXPOSED CULMEN ♀♀

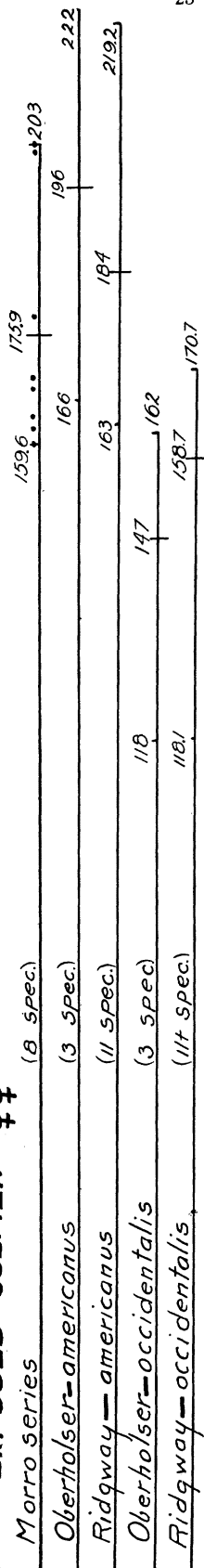


Fig. 6.

mens, where two or more subspecies may be concerned, on the basis of manifest characters irrespective of the probability of immediate blood relationships. In other words, an extreme of individual variation in one subspecies may be diagnosed as belonging to another subspecies. Great danger of coming to wrong conclusions in regard to distribution in general and routes of migration in particular will inevitably result from such interpretation. Far better to leave migrant examples, of equivocal appearance, undetermined as to subspecies. In the case of the Curlews in question the subspecific distinctions claimed are at best only average, and the characters involved pertain to only one or two dimensions. How, then, can Oberholser, or anyone else, say of the majority of individuals taken in migration (when there are no geographic probabilities to regard) which are *americanus* and which are *occidentalis*? And yet Oberholser lists *every specimen* under one head or the other!

As to Ridgway's measurements, he gives his own, of 21 specimens of *americanus* and of a somewhat "larger" number of *occidentalis* (so stated [footnote, p. 394], but not definitely specified because measurement sheets had "been mislaid"). Averages and extremes are presented. It seems quite likely that Ridgway simply followed Oberholser's lead as to the validity of the separation.

I would now call attention to the accompanying graphic exhibition of the measurements of the Morro series in comparison with the measurements of the two alleged races as given by Oberholser and by Ridgway. The dimensions given are of wing, tail, tarsus and exposed culmen; in each case the dimensions are given graphically, natural size, that is, on a scale of 1 to 1. All the measurements of the Morro series were taken by myself. The figures for the graphs were checked back and forth with the kind assistance of Mr. Halsted G. White; and the graphs themselves were drawn and lettered by Mrs. St. E. Abernathy. An enquiry as to the meaning of these graphs (figs. 5 and 6) is in order, and some very curious things come of it.

As to wing.—It is to be seen that, while Oberholser's and Ridgway's averages for *americanus* and *occidentalis* do not coincide, the amount of difference involved is close, namely, 6 and 5 percent, respectively, in males and 7 and 9 percent in females. Individual variation is such that overlapping of measurements takes place broadly in all cases except that of Oberholser's males of *americanus* and *occidentalis*, between the nearest extremes of which there is a hiatus of about 6 mm. Ridgway's longest winged *occidentalis* is within one millimeter of being as long as his longest *americanus*.

Referring to the Morro series, it is to be seen that in the males the average falls with *occidentalis*. Yet with the females it falls nearer *americanus*. (Some one may suggest that here is an instance of differential sex migration!) The individuals will be seen to be scattered along pretty evenly, without any obvious tendency to bi-modal grouping.

As to tail.—The differences here between the measurements given of *americanus* and *occidentalis* vary from 6 to 14 percent. The amount of overlapping of extremes is very irregular. The Morro series, both males and females, will be seen to fall with *occidentalis*; minima show even lesser figures. As Ridgway has pointed out (tom. cit., p. 391, footnote), there is a likelihood that differences due to method of taking the length of tail are involved.

As to tarsus.—The percentages of difference between averages of *americanus* and *occidentalis*, as given by Oberholser and by Ridgway, and for the two sexes, range from 6 percent to as much as 17 percent. Yet there is fully 50 percent

overlap when extremes are considered. The Morro series will be seen to fall into an intermediate position as to males, the average and mode both a little closer to that of *americanus*; while as to females it falls unequivocally with *americanus*.

As to culmen.—The shortness of the bill in *occidentalis* as compared with *americanus* is the feature of difference which has been emphasized most. It will be seen that this difference varies from 16 to 33 percent, on the basis of the smaller, according to sex and measurer. The amount of overlapping of extremes is small, even lacking in the case of Oberholser's figures for females (though here, it will be noted, only three individuals of each race were measured). The Morro males average almost exactly between the averages for *americanus* and those for *occidentalis*; the greater number of individuals, however, are grouped below the minima for *americanus* and nearer the average for *occidentalis*. The Morro females are also intermediate, the average a trifle nearer *americanus*, but the mode preponderantly nearer *occidentalis*. Most clearly, there are *not two* modes so that a person could say definitely that part of the individuals fall with *americanus* and part with *occidentalis*.

Conclusions.—The effort to identify the fifteen examples of Long-billed Curlew from Morro with one or the other of the two supposed races fails absolutely. There are no color features whatever to go by; and as to average of all measurements the series in question falls into an intermediate position. Yet individual variation is so great that extremes, in one respect or another, of both "*americanus*" and "*occidentalis*" are included. Because of the lack of any grouping of individuals near these extremes it is impossible to allocate the specimens under one head or the other. This fact militates against the hypothesis that both of the supposed races are represented.

Another hypothesis to be considered here is that the Morro birds, being migrants, are from a breeding ground of intermediate geographic position, so that the characters are of intermediate average and the individual variation of wide range and bringing "mosaic" behavior of characters. But the measurements of breeding birds so far published are so very few and the manner in which they are presented so unsatisfactory that nothing conclusive can be inferred on this score.

While the evidence presented by Oberholser and Ridgway points toward a *tendency* of northern bred Long-billed Curlew to be smaller than southern bred birds, the present writer is unconvinced that the amount of this tendency is great enough to warrant recognition in nomenclature. He proposes, therefore, that, at least until a more thorough demonstration to the contrary is forthcoming, the name *Numenius americanus*, without any subspecific divisions, be employed as designation for not only all the Long-billed Curlew of California, but for all those of North America.

The reader is invited to study the accompanying actual-size graphs and see what conclusions he will come to independently.

Berkeley, California, December 8, 1920.